Florence Copper Project
Aquifer Protection Permit No. P-101704
Place ID 1579, LTF No. 76820
Significant Amendment

I. Introduction:

The Arizona Department of Environmental Quality (ADEQ) proposes to issue an Aquifer Protection Permit (APP) for the subject facility that covers the life of the facility, including operational, closure, and post-closure periods unless suspended or revoked pursuant to Arizona Administrative Code (A.A.C.) R18-9-A213. The requirements contained in this permit will allow the permittee to comply with the two key requirements of the Aquifer Protection Program: 1) meet Aquifer Water Quality Standards (AWQS) at the Point of Compliance (POC); and 2) demonstrate Best Available Demonstrated Control Technology (BADCT). BADCT's purpose is to employ engineering controls, processes, operating methods or other alternatives, including site-specific characteristics (i.e., the local subsurface geology), to reduce discharge of pollutants to the greatest degree achievable before they reach the aquifer or to prevent pollutants from reaching the aquifer.

II. Permittee & Facility Location:

Florence Copper Inc.
1575 Hunt Highway
Florence, Arizona 85132

III. Facility Description:

The project is an in-situ copper recovery (ISCR) operation located in Pinal County. The copper recovery process involves injecting leach solutions (lixiviant) into the ore body using injection wells and extracting copper-bearing solutions (pregnant leach solutions or PLS) through surrounding recovery wells. The estimated injection zone is between approximately 500 feet below ground surface (ft. bgs) to 1,185 ft. bgs. The resulting copper-bearing solution will be pumped by recovery wells to the surface where copper will be removed from the solution in a solvent extraction electrowinning (SX/EW) plant. The barren solution from the SX/EW plant will be re-acidified and re-injected back into the oxide zone.

The anticipated duration of injection and recovery operation for each well is approximately 4 years. Each well will be taken out of injection/recovery service once the economically producible copper has been recovered. Injection and recovery wells that have been taken out of service will be used to rinse the formation while injection and recovery operations continue in other areas of the ISCR Area. Rinsing will be conducted in the same sequence in which the wells are taken out of service and shall commence within 6 months of a well being taken out of service, subject to a sufficient number of wells available to effectively rinse the mined area.

During rinsing, rinse solution is injected and recovered to return the injection zone to pre-leaching water quality conditions. Rinsing is estimated to begin in year 5 of ISCR operations on the first injection and recovery wells, and is anticipated to continue at each well for a period of 2 years, during which time, approximately 6 to 9 pore volumes of water will have been flushed through the formation. Rinsing will continue through the end of copper extraction operations and for another

2 years beyond. Once rinsing has been completed, each of the wells will be plugged and abandoned, except for selected wells that will remain open for monitoring post closure.

IV. Amendment Description:

The purpose of this amendment is to make the make the following changes to the permit:

1. Incorporate the discharging facilities and associated closure requirements from the Production Test Facility (PTF) Temporary Individual APP (Inventory No. 106360), as required by that permit's compliance schedule.
2. Incorporate data and information generated during the construction and operation of the PTF.
3. Revise discharge limitations to reflect the planned facility operations.
4. Incorporate updated closure cost estimates.
5. Incorporate design revisions for solution impoundments and process solution ponds, which, although previously authorized, were never constructed.
6. Update injection and recovery well design information.
7. Update the Best Available Demonstrated Control Technology (BADCT) description and incorporate BADCT elements from APP 106360, including maintenance and monitoring of a cone of depression that extends at least 500 feet from the in-situ area injection and recovery resource blocks and other BADCT monitoring within the in-situ area, including monitoring of the recovery rate of the in-situ well field, the recovered volume of the well field to the injection volume, inward hydraulic gradient between recovery/perimeter wells and POC wells, maximum injection pressure, well bore electrical conductivity, and fluid electrical conductivity.
8. Revise the Pollutant Management Area (PMA) to reflect the revised solution impoundments and process solution ponds footprint as well as the horizontal space beyond the edge of the planned ISCR well field which contains the central portion of the cone of depression which is the barrier for the ISCR operations.
9. Abandon and replace two Point of Compliance (POC) wells that have gone dry and re-locate the wells to reflect impoundment and pond design changes.
10. Revise the Discharge Impact Area (DIA).
11. Reset selected alert levels (ALs) at existing POC monitoring wells.

V. Regulatory Status

Currently, the facility is in compliance with the existing permit.

VI. Best Available Demonstrated Control Technology (BADCT):

The PLS Ponds, Raffinate Pond, Process Water Impoundment, Water Impoundments and BHP Copper Evaporation Pond will be double-lined with leak collection and removal systems. The Runoff Ponds will be single lined.

The injection and recovery well design, construction, testing and operation will meet EPA Class III requirements (40 CFR Part 146). Hydraulic control will be maintained at all times by, but not limited to: (1) pumping recovery wells at a rate greater than the injection rate in order to maintain a cone of depression that extends at least 500 feet from the in-situ area injection and recovery

resource blocks, (2) pumping more solution out than went in, (3) maintaining a 1-foot difference between pairs of recovery/perimeter wells and POC wells as a daily average, and (4) maintaining pressure in each injection well below the fracture gradient.

Hydraulic control within the ISCR area will be extensively monitored as follows (see Sections 2.2.4 and 4.2, Table 15 (In-Situ BADCT Monitoring) in the permit): (1) inward hydraulic gradient will be measured by water level elevations as a daily average in recovery/perimeter, observation and POC wells; (2) fluid electrical conductivity will be measured daily at observation and injection wells to confirm hydraulic control; (3) well bore electrical conductivity will be measured quarterly at annular conductivity devices above the middle fine grained unit on all injection, recovery, observation and perimeter wells; (4) groundwater elevations in wells completed in the Oxide ore body will be measured to confirm the groundwater elevation at the downgradient edge of the ISCR well field is lower than the edge of the downgradient PMA boundary to confirm maintenance of the BADCT cone of depression; (5) the rates of injection and recovery will be continuously monitored and controlled so that the total volume of solution recovered is 106% or greater than the volume of solution injected, averaged over a 24 hour period; (6) automatic controls and alarms will be used in the well field to ensure process upsets do not result in the loss of hydraulic control; and (7) the injection pressure in the Class III injection wells will be kept below the fracture pressure of the oxide ore body and will be measured daily at each injection well.

All boreholes or wells, other than those approved for the resource block, located within 500-feet of the well field boundary will be plugged and abandoned per the Arizona Department of Water Resources (ADWR) rules and EPA Underground Injection Control (UIC) regulations prior to resource block operation. During closure of the resource block all operational wells shall be plugged and abandoned per the above regulations

VII. Compliance with Aquifer Water Quality Standards (AWQS):

Pollutant Management Area (PMA)-

The permittee is required to show that pollutants discharged will not cause or contribute to a violation of aquifer water quality standards (AWQS) at the points of compliance (POC) or if an AWQS for a pollutant is exceeded in an aquifer at the time of permit issuance, that no additional degradation of the aquifer relative to that pollutant and determined at the applicable POC will occur as a result of the discharge from the proposed facility. The location of the POCs, which show compliance with aquifer water quality standards, is determined by an analysis of the PMA.

The PMA is described in A.R.S. §49-244(1) as (1) the limit projected in the horizontal plane of the area on which pollutants are or will be placed, (2) horizontal space taken up by any liner, dike or other barrier designed to contain pollutants in the facility, and (3) an imaginary line circumscribing the several discharge activities if a facility contains more than one discharging activity.

The PMA circumscribes the water impoundments and process ponds, and the horizontal space beyond the edge of the planned ISCR well field which contains the central portion of the cone of depression which is the barrier for the ISCR operations as described by ADEQ's Mining BADCT Manual (Part 3, § 3.4.5.3.1), which defines the "cone of depression" as the appropriate "barrier" or BADCT discharge control for in-situ leach operations. The existing PTF well field is located entirely within the planned ISCR well field.

Discharge Impact Area-

The DIA, as defined by A.R.S. §49-201.13, is the potential aerial extent of pollutant migration, as projected on the land surface, as the result of a discharge from a facility. The hydraulic containment of mining solutions and prescribed BADCT criteria within the ISCR well field is designed to prevent the migration of mining solutions beyond the PMA during facility operations.

Groundwater modeling was conducted to project the DIA thirty years after closure. The groundwater model indicates that ISCR solutions are unlikely to be transported beyond the ISCR well field during operations. Groundwater modeling also simulates that transport of ISCR solutions after the closure criteria have been met, and after hydraulic control has been discontinued, will not cause or contribute to violations of AWQSs at the POC locations.

Geochemical modeling further demonstrates that no constituent other than sulfate will migrate to the POC after cessation of ISCR operations due to the buffering capacity of the surrounding LBFU; and post-production rinsing to the target level for sulfates of 750 mg/L will likely remove other constituents of interest to near background concentrations or below AWQSs. The greatest areal extent of simulated sulfate migration, as defined by sulfate concentrations of 2 mg/L above ambient conditions, is approximately 2,000 feet downgradient of the ISCR well field within the lower portion of the LBFU.

Hydrology

The saturated geologic formations underlying the site have been divided into three distinct water bearing units; the Upper Basin Fill Unit (UBFU), the Lower Basin Fill Unit (LBFU), and the Oxide Bedrock Unit. The UBFU consists of unconsolidated to slightly consolidated sands and gravels, with lenses of finer grained material. Groundwater within the UBFU is unconfined beneath the ISCR well field. Depth to water beneath the site is approximately 235 feet bgs; and the saturated thickness ranges from 40 to 60 feet. Hydraulic conductivity within the UBFU ranges from 1 to 500 ft/day and specific yield ranges from approximately 13 to 20 percent. The UBFU and LBFU are separated by a thin, regionally extensive aquitard referred to as the MFGU, which is ranges in thickness from 20 to 40 beneath the ISCR area. The MFGU consists of calcareous clays and silty sands and due to the low hydraulic conductivity ($1X10^{-5}$ ft/day), it effectively acts as a hydraulic barrier between the UBFU and LBFU.

The LBFU consists of coarse gravel, fanglomerate, conglomerate, and breccia, and is distinguished by a greater degree of consolidation than is exhibited by the UBFU. The LBFU

beneath the site is approximately 80 feet thick, fully saturated and exhibits confined to semi-confined characteristics. The hydraulic conductivity for the LBFU is generally an order of magnitude less than that of the UBFU, ranging between approximately 0.7 ft/day to 10 ft/day.

The bedrock unit is further divided into the upper Oxide zone and the lower Sulfide zone. The upper Oxide zone is approximately 200 to 1,500 feet thick, and is the geologic formation targeted for in-situ mining. The Oxide Unit is fully saturated and exhibits confined to semi-confined aquifer conditions. Groundwater flow through the Oxide bedrock unit is controlled by secondary permeability features such as faults or fractures. The hydraulic conductivity of the Oxide Bedrock Unit ranges between 0.1 ft/day to 10 ft/day. The sulfide mineralization below the Oxide ore body is of unknown lateral and vertical extent. The Sulfide bedrock unit does not yield appreciable quantities of water and is not targeted for in-situ mining at the PTF.

The groundwater flow direction within each water bearing unit is predominately to the northwest, with some variation depending on seasonal groundwater pumping from irrigation wells located on and off-site. The Gila River is the principal source of groundwater recharge in the region and is the significant hydrologic feature affecting groundwater flow direction near the site.

Point(s) of Compliance:

There are 31 POC wells situated along the perimeter of the PMA boundary in accordance with A.R.S. § 49-244. The APP requires both quarterly and semi-annual compliance monitoring of hazardous and non-hazardous constituents at all POC locations. Monitoring parameters are provided in Section 4.1, Tables 4.1-5, 4.1-6 and 4.1-7 of the APP.

Additional Groundwater Monitoring:

For the purpose of this permit, ADEQ has established a use protection level (UPL) for arsenic of 0.01 mg/L, which is consistent with EPA's revised primary drinking water standard for arsenic. The northwest corner of the State Mineral Lease Land, on which the PTF is located, has been conservatively designated as the down gradient point at which the arsenic UPL will be applied. Consistent with ADEQ's substantive policy statement titled "Using Narrative Aquifer Water Quality Standards to Develop Permit Conditions for Aquifer Protection Permits" (Oct. 2003), an alert level for arsenic has been established for each of the in-situ POC wells through consideration of fate and transport of arsenic to ensure that the UPL is not exceeded at the northwest corner of the State Mineral Lease Land.